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THAILAND: I. A BIRD'S EYE VIEW OF THE COUNTRY [1]

F. M. FRONDA [2]

WITH THREE TEXT FIGURES

To some who will read this article, Thailand (Siam) is not entirely a strange country. They may have learned something about it before through the many Thai students who have attended various universities, colleges, and schools in this country. Surely, some must have recently read in the local papers that Thailand was the main source of the rice that our country imported to supplement our rice supply. Their knowledge about Thailand, however, must necessarily be limited though diverse.

To really know Thailand and appreciate the country, her people, and her natural resources, one has to go there, live there, and be with her people. I had the rare opportunity of staying in Thailand for a year when the Food and Agriculture Organization of the United Nations, through its Expanded Technical Assistance Program, asked me to advise and assist the government of Thailand in the breeding and management of poultry and in teaching poultry subjects and training personnel in this field. This assignment brought me in close contact with her people and therefore enabled me to know something about the country. I had to work with the Thais and study their needs and food requirements since the aims of the Food and Agriculture Organization, as provided in the preamble of its constitution, are to raise the levels of nutrition and standards of living of the people, secure improvement in the efficiency of production and distribution of all food and agricultural products, and improve the condition of the rural population and, by so doing, contribute toward an expanding food economy.

To start with, the kingdom of Thailand is in the Indo-Chinese peninsula, as may be seen in the accompanying map (fig. 1). It is west of the Philippines, one hour away by the clock. This means that when it is 11:00 o'clock in the morning in Thailand, it is already noon in Manila.

The country has a varied but well-defined topography and, for this reason, is divided into four natural regions—North, Northeast, Central, and South. In total area, Thailand covers a little over 200,000 square miles,[3] about one-fourth of which is in the central

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[1] General Contribution No. 855.

[2] Poultry Production Expert (Thailand, 1951-1952) of the Food and Agriculture Organization of the United Nations.

[3] The land area of the Philippines is approximately 115,600 square miles.

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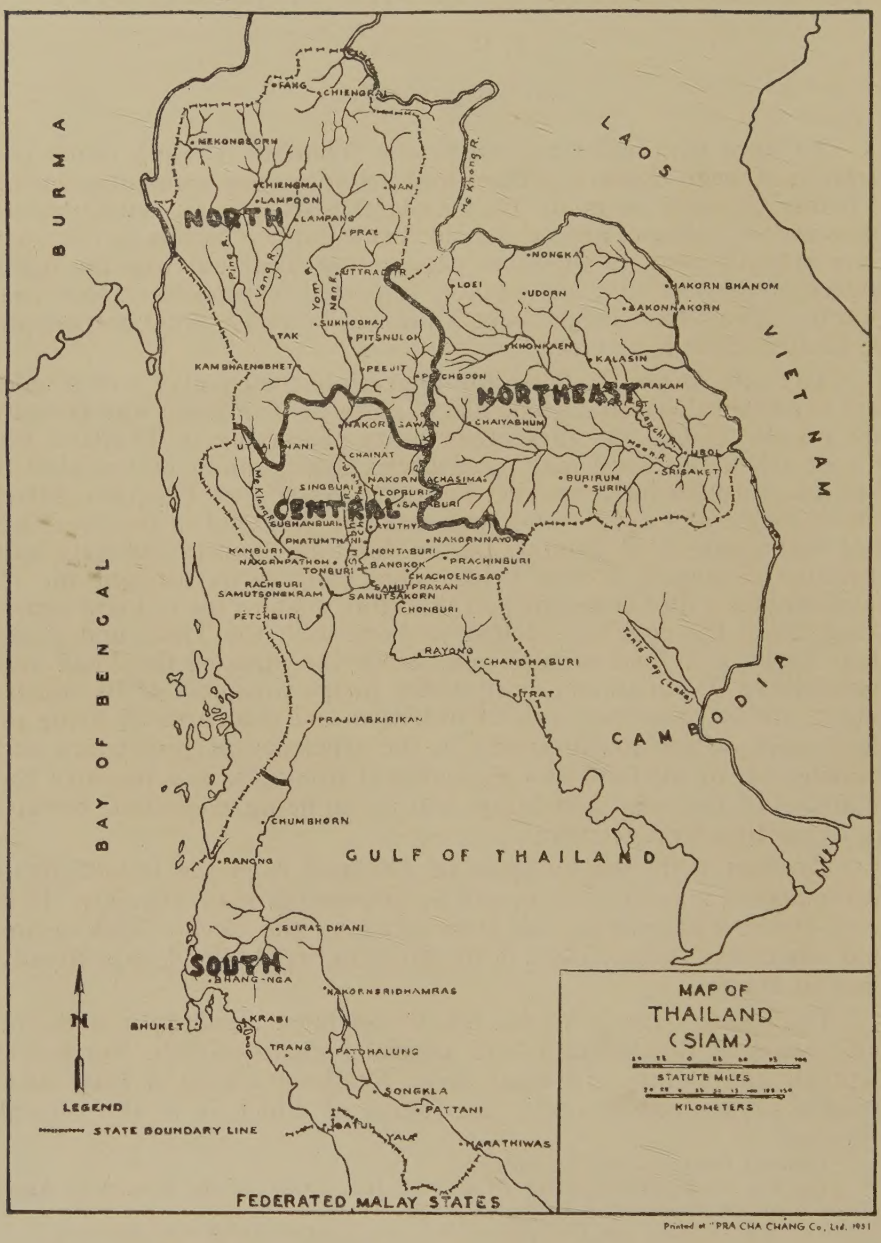

Fig. 1.—Map of Thailand (Siam).

region. Unlike the other regions which are hilly and mountainous, this region is monotonously flat, very low, and subject to floods, the elevation in most places being hardly a meter above sea level. It is in this area where the bulk of the rice crop for export is grown. A considerable amount of rice is also grown in the other regions of the country, but this rice is mostly for local consumption.

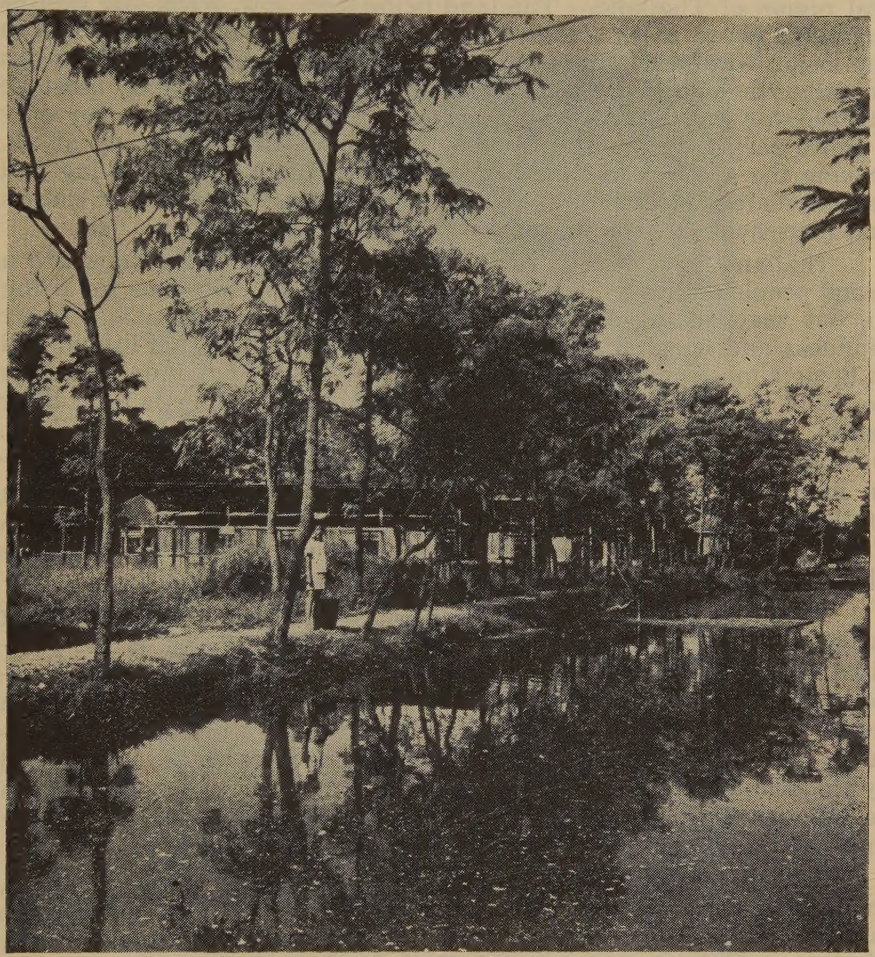

Fig. 2.—This *klong* in Central Thailand was dug to get the soil to fill in the lot on which the poultry houses were built.

Thailand lies north of the equator, about the same distance from it as the Philippines. The climate is therefore very much the same as ours, except that it is much hotter during summer, that is, April and May, and much colder during the winter months, December and January. The rainy season begins about the middle of May and

ends in October. The country, being outside the typhoon belt, is free from destructive typhoons. This freedom from storms is one of the significant points that a Filipino will notice about Thailand. The rains, however, are at times heavy enough to cause the flooding of Bangkok, the capital city of Thailand, and the surrounding areas.

The *klongs* (canals) (fig. 2) are a prominent feature in the central region of Thailand. The land being very low, when one desires to build a house, it is necessary to dig from the canals the soil to fill in the lot on which the house is to be built. Obviously, before one can actually start building, some time, usually about one year, must be allowed for the filling to settle. Some *klongs* become dry for only a short period during the summer, but many do not dry up at all. During the greater part of the year, the canals are overflowing and are convenient places for the people to bathe and wash their clothes and household utensils in and excellent places in which to fish.

Thailand is still very much underpopulated. The Thais are a proud people and they have excellent and justifiable reasons for being so, but they are also very respectful, kind, and hospitable. Their kindness and hospitality help considerably in making a Filipino feel at home almost immediately upon setting foot in Thailand. There is no doubt that, like the people of other countries, the Thais have their faults, but discourtesy to a foreigner is certainly not one of them. Of course, the language difficulties, both spoken and written, offer an immediate problem to a visitor, but after a few weeks, enough of the spoken language can be learned to enable him to go around. There are now in Thailand Filipinos who can speak the language almost as well as the Thais and who can write as fluently.

Although Thailand is largely an agricultural country, farming is not the only occupation of the people. Rice, however, is the principal export. Lumbering is an important industry and the teak exports of Thailand constitute a considerable portion of her foreign trade. Rubber and tin are also important export products of Thailand. The fishing industry of the country supplies all the fish needed by the people and, significantly, provides a sufficient surplus that can be manufactured into fish meal for the rapidly expanding poultry industry of the country.

Rice and fish are the staple food of the Thais. To a Filipino, then, Thai food will not taste strange. It is, however, a little too hot for an average Filipino, but it can be easily modified to suit his taste. Chinese restaurants offering a varied selection of dishes abound, and the food costs much less than that served in Manila. The Thais are fond of eating out; consequently, the restaurants, in spite of their great number, are almost always crowded during the eating hours.

Although Buddhism is the national religion of Thailand, there are also many Christians, both Catholics and Protestants. The Thais are a very religious people and *wats* (temples) (fig. 3) are prominent

structures in cities and towns. In Bangkok alone, there are about eighty of them. These multicolored and glittering temples and the many yellow-robed monks wandering about begging for food lend picturesqueness to the city. The monks vow to forsake the world for periods of time varying from several months to a lifetime. It is said that there are very few male Thais who have not spent at least several months in a monastery either as a novice or as a monk.

Fig. 3.—*Wats* (temples) are prominent structures in cities and towns in Thailand.

The Thais amuse themselves in a variety of ways. In Bangkok there are many cinemas where both foreign and local pictures are shown. There are Thai as well as Chinese theaters; occasionally, foreign plays are also presented. There is boxing, both Thai and international styles, and during the summer months, kite flying attracts big crowds every afternoon. Football is the national game

in Thailand and tennis has begun to win many enthusiasts. Basketball is only beginning to attract a following, but there are healthy signs that it may become as popular as football. Classical dancing is an old art in Thailand. The habit of going to night clubs is becoming widespread. In Bangkok, however, night life ends shortly after midnight.

A visitor in Bangkok will notice that the city has now become a melting pot of Western and Southeast Asian cultures. The people are fast adopting Western ways of living. These, combined with their own many-centuries-old mode of life, make Bangkok a city unique in the entire Southeast Asian world.

COMPARISON OF TWO METHODS OF CLEANING ABACÁ FIBERS IN THE U.P. COLLEGE OF AGRICULTURE [1]

AGATON T. CARAG

WITH FIVE TEXT FIGURES

Based on the fresh weight of leaf sheaths, the percentages of fibers extracted by hand and by machine from group I (leaf sheaths 1 to 5) and group II (leaf sheaths 6 to 10) of Samurong Pula and Samurong Puti ranked first. Group III (leaf sheaths 11 to 15) was second, and group IV (leaf sheaths 16 to 20), last. The percentage of extraction based on weight of the whole stalk ranged from 1.31 to 1.87.

Group II had a significantly higher tensile strength than groups I, IV, and V (leaf sheaths 20 and above); group III was higher than group V.

From the standpoint of fineness of fiber of either variety, the innermost leaf sheaths in group V gave the finest fiber, whereas group I produced the coarsest.

Perhaps the most important factors that affect the quality and texture of abacá fiber are variety and method of cleaning or extraction. In the different regions of the Philippines where abacá is grown for commercial purposes, the fiber is either hand-stripped or cleaned with a motor-driven spindle machine. So far, there has been no clear-cut differentiation between the quality of abacá fiber stripped by hand and that cleaned with the spindle machine. The present study was conducted in the Perennial Crops Division of the Department of Agronomy of the Central Experiment Station of the College of Agriculture, Los Baños, Laguna, from May, 1951, to September, 1952, to compare two methods of cleaning abacá: namely, with the use of the "hagutan" and with the use of a small motor-driven spindle machine.

MATERIALS AND METHODS

Topping the mature stalks. Fourteen mature abacá stalks, seven of Samurong Puti and seven of Samurong Pula, were selected and harvested for the study. The mature stalks (at flowering stage) were cut off with a long-handled, double-bladed sickle or topping knife (fig. 1b) just above the point where the petioles start to bunch. This was done to facilitate felling of the stalk. The dried leaves were cut off and the upper portion of the abacá stool was cleaned.

Tumbling, piling, and weighing the stalks. The lower portion of the abacá stools was cleaned. The topped stalks were felled with a hemp knife or tumbling bolo (fig. 1a); the bases of the stalks were

[1] Central Experiment Station Contribution No. 1663. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Agronomy under the direction of Associate Professor Pedro A. David.

cut diagonally as close as possible to the ground. This was done to prevent accumulation of water that would cause the remaining stumps to rot. The direction of the cuts was toward the center of the stool. It did not matter if some young suckers growing in the center were destroyed during the operation, as they were overcrowded. The stalks were piled (fig. 2) near the shed of the motor-driven spindle machine. The fresh weight of each stalk was recorded.

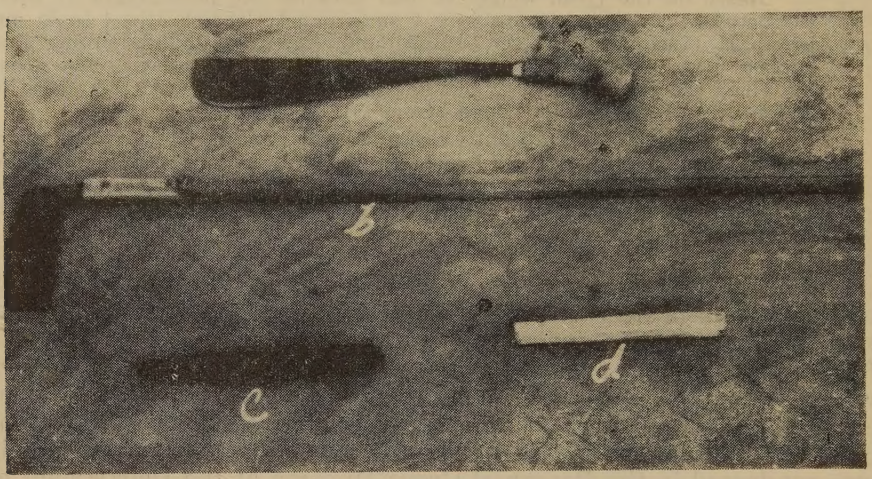

Fig. 1.—Tools used in harvesting and extracting abacá fiber: a. hemp knife (tumbling bolo); b. topping knife (a long double-bladed sickle); c. splitting knife used for preparing the *tuxy;* d. a piece of wood used for coiling the extracted fiber in the "hagutan" method.

Preparing and weighing the tuxy. Tablante [2] described two methods of making *tuxies,* namely, the "luknit" method in Sorsogon and the "baknis" method in Albay. A method of preparing *tuxies* which is similar to the "luknit" method is employed in Davao. This method was used in this study. Each leaf sheath of the stalk was split (fig. 2) at the base between the epidermal layer and the fleshy portion of the leaf sheath with a splitting knife (fig. 1c). The epidermal layer was divided into three or four strips depending on the size of the leaf sheath. Each strip was grasped with the left hand and, with a forceful jerk, pulled off from the leaf sheath. The strips from each group of five leaf sheaths were bundled separately, labeled, and weighed. The grouping of the ribbons started from the outermost sheaths, that is, leaf sheaths 1 to 5, 6 to 10, 11 to 15, 16 to 20, and 21 and above belonged to groups I, II, III, IV, and V, respectively.

[2] TABLANTE, N. B. The problems of abacá farming in the Bicol region. Philippine Agriculturist 35: 291–303. *Fig. 1–3.*

Extracting the fiber with the motor-driven spindle machine. The *tuxies* of each group of leaf sheaths were divided into two parts. One part was cleaned by hand and the other, with a motor-driven spindle machine. A general view of the machine is shown in fig-

Fig. 2.—Preparation of the *tuxy* from abacá stalk. (*Photograph by Olive's Studio*)

ure 3. A spindle is keyed to one end of the shaft and a flywheel to the other. The pulleys (one fixed and one idler) are mounted near the flywheel. These pulleys are driven by a belt from the pulley of a motor. The shaft with the flywheel, the two driven pulleys, and the spindle are supported by bearings mounted on a six-legged trapezoidal platform made of first-class wood. A stripper blade, which is attached to an iron plate, is bolted to a piece of hard wood which is held firmly to the base by bolts. An adjustable screw is attached to the top of the table plate for adjustment of the fitness of the table plate and the stripping knife. Covered with a piece of tin and fastened to the table plate are two thin steel sheets, a cut belt, and a piece of rubber about one and a half centimeters wide and twenty centimeters long (as long as the table plate). The rubber serves as a spring to prevent excessive cutting of the fiber. At the plate bar (a portion of the table plate) is a spring attached to a lever which serves as the weight. At the further end of the plate bar another lever is connected to still another lever, and this, in turn, is connected to the pedal.

The motor was started and the belt was placed on the idler pulley. Once the flywheel had gained momentum, the belt was shifted to the fixed pulley which was the source of the power that pulled the *tuxy*.

When the operator stepped on the pedal or treadle, the table plate and stripper knife were separated. Five to ten ribbons were placed between the stripper knife and the table plate. They were wound two or three times on the revolving spindle. Simultaneously with the last winding on the spindle, the operator exerted a light downward pull following the rotation of the spindle (fig. 3). As the spindle

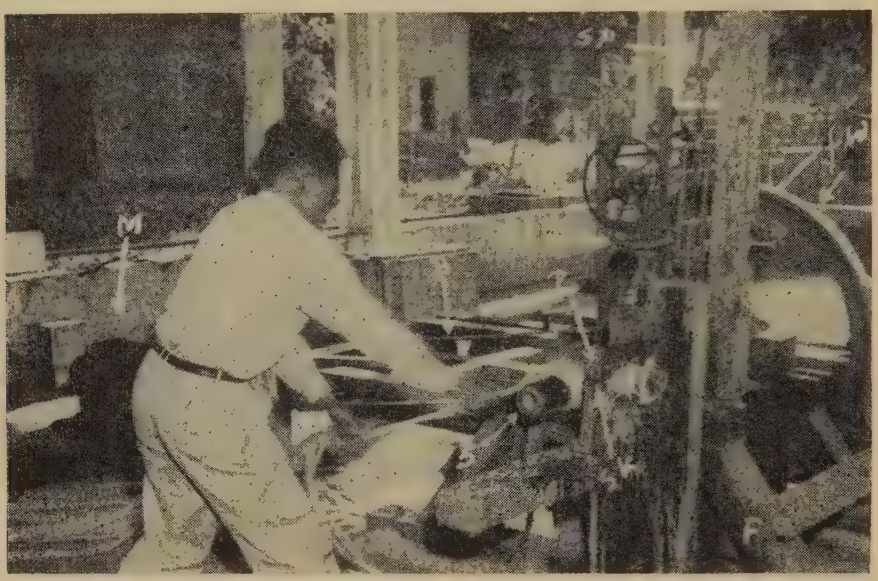

Fig. 3.—Extraction of fiber with a motor-driven spindle machine. M—motor; B—belt connecting the pulley of the motor and the pulleys of the spindle; S—spindle; SK—stripper knife; P—table plate; SP—spring attached to the lever; F—one of the essential supports of the platform where the bar of the flywheel rests; FW—flywheel.

rotated, the *tuxy* was pulled, the fiber being extracted. The other end of the *tuxy* was then subjected to the same treatment. The extracted fiber was placed on the hanger. Then the grouped fibers were dried to a constant weight (fig. 4).

Extracting the fiber by hand. The College "hand-hagutan" is an improved version of the typical stripping apparatus in Davao. The smooth-edged knife rests against a piece of tin fastened to a wood block.

In extracting the fiber, the foot pedal was pressed with the right foot to provide a clearance between the blade and the block where the *tuxy* was to be inserted. When the *tuxy* was in place, the foot treadle was released. A portion of the *tuxy* was wound on a short piece of wood (fig. 1d), and a uniform pulling motion was exerted

until the *tuxy* had passed the blade. Then the portion of the *tuxy* wound around the wood was subjected to the same treatment. Each group was stripped separately to avoid mixture of the fibers. After the whole stalk was finished, the fibers from each group were labeled, properly dried, and weighed.

Samples of single-fiber strands taken at random from each group of fibers were prepared and five trials were made for every group. A Scott Testers IP-2 tensilgraph machine (fig. 5) was used to determine the breaking load of a single fiber strand. This machine is mounted on a strong table installed on a level position and is operated at a 25-degree inclination of the tilting beam. The automatic reverse is regulated by the position of the dog on the gear rack. To reverse the tilting beam, that is, to return it to its starting position, the trip lever, which holds the bell crank starting lever in the running position, is pressed down.

Fig. 4.—Drying the fiber in groups.

The motor itself operates through a safety switch which automatically moves to the "off" position in case of an overload. A flexible cord and a conventional plug connect the machine to the electric-current motor drive running through a gear reduction and a gear-box driving shaft, to which is attached the rack driving gear.

After all the necessary adjustments had been made on the machine, a 2,000-gram chart (fig. 5 CH) was placed on the pin. The pen was adjusted to coincide with the zero mark of the chart. The fiber sample was then fastened to the two jaws which were ten centi-

meters apart. A 2-kilogram carriage was used. The machine was started by pushing down the bell crank handle on the right side of the bell box. When the fiber broke, the breaking load registered on the chart was noted. The broken fiber was cut close to the sides of the jaws with a sharp razor blade and later weighed in the analytical balance. Three sections, the base, middle, and tip of each fiber strand, were tested. The operation was repeated until the required number of trials was completed.

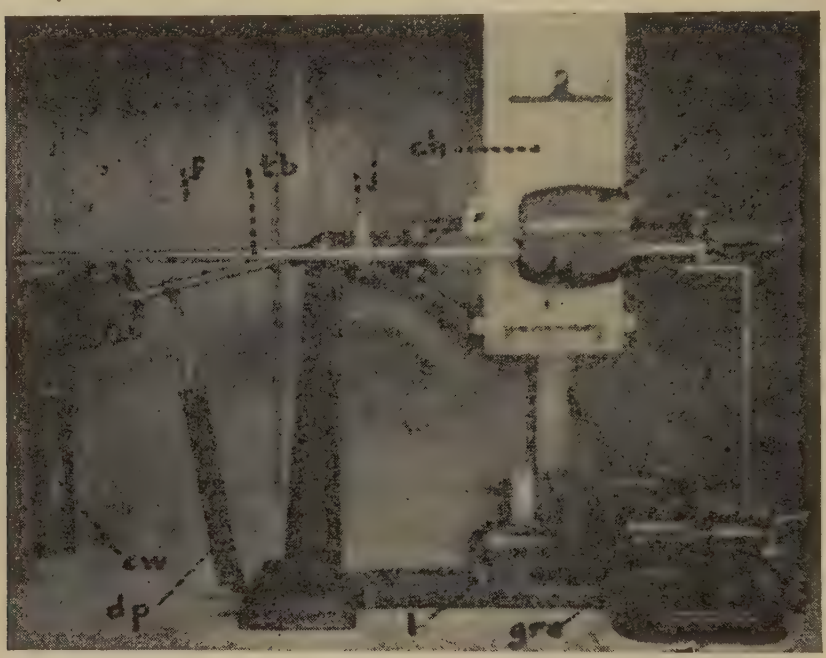

Fig. 5.—The Scott Testers IP-2 Tensilgraph machine used to determine the breaking load of abacá fiber. F—single fiber strand; TB—tilting beam; J—jaw; CH—2000-gram chart; C—carriage; CW—counter weight; DP—dash pot; L—spirit level; GRE—gear reduction box; M—motor; DG—rack driving gear; BCH—bell crank handle; GR—gear rack.

The tensile strength was then computed according to the following formula of Botkin, Shires, and Smith: [3]

$$\text{Tensile strength} = \frac{\text{Breaking load}}{\text{Weight of sample per centimeter}}$$

The mean tensile strength of the three sections (base, middle, and tip) of each strand was considered the tensile strength of that strand.

[3] Botkin, C. W., L. B. Shires, and C. Smith. 1943. Fiber of native plants in New Mexico. New Mexico Agric. Exper. Sta. Bull. 300: 1-38. *Fig. 1-12.*

Analyzing the fineness of fiber. The fineness of the fiber as indicated by the "Metric No.," which is defined as the length of the fiber in kilometers per kilogram, was computed by the Dantzer and Roehrick formula:

$$\text{"Metric No." (in kilometers)} = \frac{100\ nl}{P}$$

where n = Number of fibers
l = Length of fiber in centimeters
P = Weight of whole in milligrams

After the fiber had dried, a 10-centimeter-long portion was cut from the middle of the fiber strands of each group. From this cut portion, five groups of 100 fiber strands were counted. Each count was weighed in the analytical balance.

RESULTS AND DISCUSSION

The two varieties studied could be distinguished from each other externally by the color of their false stems. As its name signifies, Samurong Pula has reddish outer leaf sheaths, whereas Samurong Puti has brownish outer sheaths. The *tuxies* of the latter variety were comparatively easier to prepare.

Amount of fiber. Tables 1 and 2 show the amounts of dry-weight fiber expressed in percentages based on the fresh weight of leaf sheaths of each group. Group I of Samurong Pula gave the highest mean percentage of extraction, 2.24 (table 1). Groups II, III, and IV produced 2.14, 1.66, and 1.18, respectively. The differences in percentage of extraction among groups I, II, and III were not significant; neither was the difference between group III and group IV. Groups I and II, however, had significantly higher percentages of extraction than group IV. The method employed in extracting the fiber did not influence significantly the percentage of fiber produced.

It will be noted in table 2 that group I of Samurong Puti also had the highest mean percentage of extraction. Groups II, III, and IV followed with mean percentages of extraction of 2.17, 1.55, and 1.02, respectively. Both groups I and II had significantly higher percentages of extraction than group III, and Group III had a higher percentage of extraction than group IV. With Samurong Puti, the method of extraction did not influence significantly the percentage of extraction.

Tensile strength. Tables 3 and 4 show the tensile strength of the fibers from the different groups. Fibers obtained from group II, extracted from leaf sheaths 6 to 10 of the variety Samurong Puti, were found significantly stronger than those from groups I, IV, and V, but not stronger than those from group III (table 3). According

to Espino [4] the brittleness of the fiber from the outside leaf sheaths is due to the presence of a great number of stigmata, whereas the weakness of the strands from the innermost sheaths is due to the undeveloped cell walls. It was also found that group III produced significantly stronger fibers than group V. The tensile strengths of groups I, IV, and V did not differ significantly from each other. The method of extraction did not seem to affect the tensile strength of the fiber.

It can be seen in table 4 that, as in Samurong Puti, the fibers from group II (sheaths 6 to 10) of Samurong Pula were significantly stronger than the fibers from groups I (leaf sheaths 1 to 5), IV (sheaths 16 to 20), and V (sheaths 20 and above), but not stronger than those from group III. The fibers from group III were significantly stronger than the fibers from group V, but not significantly stronger than the fibers from groups I and IV. Groups I, IV, and V produced fibers which did not differ greatly in tensile strength. As in Samurong Puti, there was no significant difference in tensile strength between the fibers extracted by machine and by hand.

Fineness of the fiber. The fineness of the fibers in the different groups of leaf sheaths is shown in tables 5 and 6. The innermost leaf sheaths (group V) of Samurong Pula gave the finest fiber (table 5). A kilogram of the fiber would cover a distance of 625.79 kilometers. The "Metric No." of group V was significant over the other groups. Group IV had a mean of 346.45 kilometers which was significantly finer than groups III, II, and I. The method of extraction did not influence fineness.

The fineness of the fibers of the different groups from Samurong Puti (table 6) proves further that group V (the innermost leaf sheaths) and group IV (leaf sheaths 16 to 20) gave the finest fibers. Expressed in kilometers they were significantly finer than either group II or III, whereas group II was finer than group I.

RECOMMENDATION

To facilitate classification and to avoid mechanical mixing of the fibers from the outer sheaths with those from the middle and inner sheaths, it would be advantageous to group the different leaf sheaths into groups of five during the process of preparing the *tuxies* or ribbons.

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[4] ESPINO, R. B. 1915. Abacá fiber. Philippine Agriculturist and Forester 4: 200–216. *Pl. 1–5.*

TABLE 1

Percentage of dry-weight fiber based on weight of leaf sheaths of each group of variety Samurong Pula

METHOD	VARIETY	GROUP				MEAN
		I	II	III	IV	
Hand	Samurong Pula	2.42 2.68 2.48	1.94 2.33 2.45	2.37 1.24 2.41	1.77 .84 .84	1.98
Spindle	Samurong Pula	2.06 2.07 1.75	1.94 2.21 2.04	1.14 1.50 1.30	1.10 1.48 1.04	1.66
Mean		2.24	2.14	1.66	1.18	

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	3	4.3521	1.4507	11.47	9.28	29.46
Method	1	0.8799	0.8799	6.96	10.13	34.12
Group X method .	3	0.3794	0.1265			
Sampling error ..	16	1.9197	0.120			
Total	23	7.5311				

L.S.M.D. for group = 0.65

TABLE 2

Percentage of dry-weight fiber based on weight of leaf sheaths of each group of Samurong Puti

METHOD	VARIETY	GROUP				MEAN
		I	II	III	IV	
Hand	Samurong Puti	2.57 2.67 2.05	2.31 2.14 2.16	1.60 1.54 1.52	1.34 1.12 1.02	1.84
Spindle	Samurong Puti	2.21 2.24 2.24	2.24 2.12 2.06	1.57 1.58 1.49	1.04 .58 1.44	1.73
Mean		2.33	2.17	1.55	1.02	

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	3	5.9087	1.9696	182.37	9.29	29.46
Method	1	0.0630	0.0630	5.83	10.13	34.12
Group X method	3	0.0325	0.0108			
Sampling error .	16	0.6886	0.0630			
Total	23	6.6928				

L.S.M.D. for group = 0.19

TABLE 3

Tensile strength in kilometers of fibers from the different groups of leaf sheaths of an abacá stalk (variety Samurong Puti)

METHOD	GROUP					MEAN
	I	II	III	IV	V	
Spindle	80.8	48.7	82.3	83.3	65.3	
	82.2	124.7	69.6	70.7	51.1	
	52.7	74.5	83.0	58.9	52.8	
	74.1	80.3	81.7	54.5	55.8	
	62.6	122.1	82.5	62.6	67.9	72.99
Hand.	76.9	87.6	75.3	39.6	32.9	
	56.8	71.3	79.4	43.7	44.8	
	89.4	120.0	102.0	83.1	74.2	
	73.4	116.2	100.3	87.6	82.8	76.75
	67.2	96.4	71.5	81.4	65.0	
Mean	71.61	94.18	82.76	66.54	59.26	

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	4	8483.89	2120.97	9.17	6.39	15.98
Method	1	1074.94	1074.94	4.65	7.71	21.20
Group X method	4	924.82	231.21			
Sampling error .	40	12075.51	301.89			
Total	49	22559.16				

L.S.M.D. for group = 18.88

TABLE 4

Tensile strength in kilometers of fibers from the different groups of leaf sheaths of an abacá stalk (variety Samurong Pula)

METHOD	GROUP					MEAN
	I	II	III	IV	V	
Spindle	61.9	75.4	65.4	71.0	65.8	
	54.2	76.6	85.6	51.4	69.2	
	72.1	81.4	66.6	61.9	49.0	
	103.3	59.2	83.3	72.0	59.1	
	48.6	61.5	46.4	55.4	52.6	66.00
Hand	68.7	129.7	96.7	71.7	55.2	
	81.8	86.6	72.7	76.1	60.8	
	70.5	81.4	100.0	70.7	61.4	
	68.8	75.4	55.5	55.4	68.3	
	54.2	55.0	58.8	60.6	60.2	71.85
Mean	68.41	78.21	73.20	64.62	60.14	

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	4	2002.97	500.74	8.12	6.39	15.98
Method	1	428.29	428.79	6.95	7.71	21.20
Group X method .	4	246.67	61.67			
Sampling error ..	40	9932.19	248.30			
Total	49	12610.12				

L.S.M.D. for group = 9.75

TABLE 5

Fineness in kilometers of fibers from the different groups of leaf sheaths of an abacá stalk (variety Samurong Pula)

METHOD	GROUP					TOTAL	MEAN
	I	II	III	IV	V		
Hand	279.6	302.5	327.5	374.1	684.5	1968.2	
	269.1	311.1	363.7	376.5	601.9	1922.3	
	270.3	312.4	307.8	382.3	610.1	1882.9	
	301.3	272.0	373.2	334.7	640.2	1921.4	
	274.2	323.6	309.8	353.4	626.7	1887.7	
Spindle	252.3	253.2	255.7	322.1	638.6	1721.0	
	272.4	285.3	294.6	342.5	629.4	1824.2	
	256.3	276.8	286.9	317.6	616.3	1753.9	
	263.7	277.4	312.4	326.7	602.5	1782.7	
	261.5	251.7	301.4	334.6	607.7	1756.9	
Mean	270.07	286.60	313.30	346.45	625.79		

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	4	860274.15	215068.61	66.99	6.39	15.98
Method	1	11038.37	11038.37	3.44	7.71	21.20
Group X method	4	12841.14	3210.29			
Sampling error	40	9070.00	226.75			
Total	49	893223.96				

L.S.M.D. for group = 70.34

TABLE 6

Fineness in kilometers of fibers from the different groups of leaf sheaths of an abacá stalk (variety Samurong Puti)

METHOD	GROUP					MEAN
	I	II	III	IV	V	
Hand	433.5	589.0	643.9	968.9	1162.8	
	446.7	591.9	641.8	970.3	1156.7	
	439.6	587.2	637.3	974.1	1149.3	
	428.1	596.8	651.4	962.7	1170.3	
	459.7	600.3	629.7	965.2	1156.7	760.56
Spindle	427.4	486.9	590.1	762.6	914.1	
	416.3	489.1	599.3	770.2	1006.2	
	402.5	497.2	578.7	768.9	949.2	
	407.4	495.3	586.9	794.8	1104.8	
	425.6	502.4	594.2	782.7	996.8	653.98
Mean	428.68	543.61	615.33	872.04	1076.69	

Analysis of variance

SOURCES OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE VARIANCE	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Group	4	2665602.37	666400.59	17.50	6.39	15.98
Method	1	142929.89	142929.89	3.75	7.71	21.20
Group X method .	4	152306.63	38076.66			
Sampling error ..	40	20670.56	516.76			
Total	49	2981509.45				

L.S.M.D. for group = 242.23

THE INFLUENCE OF ANIMAL PROTEIN FACTOR AS A SUPPLEMENT TO GROWING CHICK RATIONS CONTAINING VARYING AMOUNTS OF FISH AND MUNGO MEALS [1]

SEVERINO R. SANTOS, JR.

Based on rate of growth, feed consumption and cost, and percentage of mortality, the results of this study showed that as much as 25 per cent of the fish meal in chick diets could be satisfactorily substituted with mungo meal when 1 per cent APF was supplemented to the rations. However, the substitution of a greater amount of fish meal with mungo, even when APF was added, yielded poor results.

Animal or fish protein supplies a certain factor or factors required for growth and reproduction not supplied in adequate amounts by vegetable proteins. This factor is known as APF (animal protein factor.) [2]

The important role of APF in poultry nutrition is attested to by the comparatively voluminous literature devoted to it despite its recent discovery. Bird, Rubin, Whitson, and Haynes (1946) and Wiese, Petersen, and Lampman (1948) presented evidences to show that supplementation to an all-vegetable breeder or growing ration of animal protein factor results in higher hatchability, increased chick growth, and lower mortality during the first few weeks after hatching. Similarly, experiments conducted at the Iowa Agricultural Experiment Station by Johnson (1949) showed that the addition of APF feeding supplement to a basal ration composed of plant proteins and liberal amounts of vitamins A and D, riboflavin, panthothenic acid, niacin, and choline produced chicks that equaled in growth and appearance those fed a similar basal ration containing animal proteins. On the other hand, McGinnis [3] demonstrated that the addition of APF feeding supplement to a diet containing a high percentage of fish meal gave measurable increases in growth.

Fish meal, being an imported product, is not always available in the market. To partly solve the problem of an inadequate supply of fish meal, the use of this feed may be reduced to a minimum by replacing a part of it with protein feeds that are easily available without seriously reducing the optimum APF requirement of the

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[1] Central Experiment Station Contribution No. 1664. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1952. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda and Instructor A. C. Campos.

[2] APF, in spite of its name, is not a protein but a complex consisting of vitamin B-12 and one or more dietary factors required by poultry fed with all-vegetable rations complete in the known nutritive essentials. The dietary factor(s) was recently identified as antibiotics.

[3] MCGINNIS, J. 1949. Report to the Washington State Poultry Council (Mimeographed).

birds. Mungo (*Phaseolus aureus* Linn.), a vegetable protein, is locally produced and has possibilities of being grown on a large scale. Although vegetable proteins do not contain enough animal protein factor to support normal growth, mungo meal might still prove useful when used to replace a part of the fish meal in chick rations if it is supplemented with APF. Like fish meal, APF is also an imported product, but when fish meal is scarce and APF is available, a little amount of fish meal supplemented with mungo meal and APF may produce satisfactory results. To find out, this study was conducted in the Department of Animal Husbandry from December, 1950, to November, 1951.

MATERIALS AND METHODS

A total of 243 day-old, legbanded New Hampshire chicks were used in this study. Three trials, each covering a period of twelve weeks, were conducted. Each trial consisted of three lots; 26 chicks were assigned to each lot in the first trial, 30 in the second, and 25 in the third. The first trial was conducted from January 20, 1951, to April 14, 1951; the second, from April 30, 1951, to July 16, 1951; and the third, from August 20, 1951, to November 12, 1951.

The chicks were given an all-mash ration with the following ingredients, all parts by weight:

Rice bran	55	55	55
Corn	20	20	20
Copra meal	5	5	5
Fish meal	15	10	5
Mungo meal	5	10	15

To every 99 parts of the ration, one part APF [4] was mixed very thoroughly. The chicks were fed finely chopped green feed daily and were allowed free access to water and ground grit and shells.

Until they were seven weeks old, the chicks were raised in electrically heated battery brooders exposed to the sun daily. Then they were transferred to unheated battery cages where they remained until they were 12 weeks old. In all the trials, all the lots were given identical care and management.

The initial and weekly weights of the individual birds, the mortality, and the amount and cost of feed consumed were recorded.

RESULTS AND DISCUSSION

Rate of growth. The rates of growth of the chicks as measured by their weekly weights are shown in table 1. On the twelfth week of all the trials, the average weight of the birds in lot 1 was higher

[4] The APF preparations used in this study were manufactured by the Lederle Laboratories Division of the American Cyanamid Company under the trade name "APF–5" and by the U. S. Industrial Chemicals, Inc. under the trade name "U.S.I. APF," the latter being sold in the local market at ₱5.00 a kilogram.

than that in lot 2 and much higher than that in lot 3. The average of the three replicates showed that the birds in lot 1 attained a mean weight of 968.3 grams at the end of the experiment; those in lot 2, 880.1 grams; and those in lot 3, only 669.3 grams. The differences in the final weights of the birds in the three lots were marked.

The chicks in lot 1 had higher initial weights than those in the other two lots. The average initial weights were as follows: lot 1, 40.4 grams; lot 2, 39.5 grams; and lot 3, 39.1 grams. Since the chicks in each group were selected at random and were hatched under the same normal conditions, the initial weight advantage of lot 1 over the others had no influence on the difference in rate of growth of the chicks in the different lots (Asmundson and Lerner, 1942). This initial weight advantage could not be used as a factor to invalidate the superiority of lot 1 at the end of the experiment. Furthermore, the average of the three trials in all the lots clearly showed that from the first to the twelfth week, the birds in lot 1 were consistently heavier than those in lot 2 which, in turn, were heavier than those in lot 3.

In general, the results of this study as far as rate of growth is concerned indicate that mungo can satisfactorily replace as much as one-fourth of the fish meal in chick rations containing APF supplement.

Feed consumption and cost. The amount and cost of feed consumed by the birds and the returns above feed cost based on 100 twelve-week-old weanlings are given in table 2. The averages of the different lots show that of the three lots, lot 1 had the highest average feed consumption (329.9 kilograms), followed by lots 2 (292.9 kilograms) and 3 (234.3 kilograms). With the amount of feed required for every kilogram gain in weight as the measure of efficiency of feed utilization, lots 1 and 2 had practically the same efficiency rating. The amounts of feed required for every kilogram gain in weight were as follows: lot 1, 3.53 kilograms; lot 2, 3.49 kilograms; and lot 3, 3.72 kilograms.

Since the poultry raiser is more interested in the monetary returns from his flocks than in mere efficiency of feed utilization, the cost of feed to produce a given gain in weight becomes a better yardstick with which to determine the best ration. In this regard, lot 1 and lot 2 were in exactly the same category; lot 3 somewhat lagged behind. However, with the returns above feed cost as the final test for the three rations, lot 1, with ₱138.15 overhead, was the best; lot 2, with ₱125.40, the second; and lot 3, with only ₱92.13, the last. The relatively lower returns above feed cost of lots 2 and 3 were largely due to the high cost of mungo when this study was conducted. Mungo cost ₱0.63 a kilogram; on the other hand, the same weight of fish meal cost ₱0.57.

The salient figures presented in table 2 can be summarized to mean that mungo can replace part of the fish meal in a chick diet if

it is grown on a large scale so that it will cost much less than fish meal; otherwise, it would not be practical to incorporate mungo meal in chick rations.

Mortality. The most striking result of this study was the relatively low mortality in the three lots in all the trials (table 3). In lot 1, out of an average of 27 chicks used in each trial, only 0.66 bird, or two birds in three trials, died; in lot 2, 2.33 chicks died out of the same number of birds used in each trial; in lot 3, an average of one chick died in each trial. The percentage of mortality was 2.61 for lot 1, 8.51 for lot 2, and 3.72 for lot 3. Feeding the College all-mash chick ration without APF supplement to New Hampshire chicks, Ramos (1950) and Diñgayan (1950) obtained a 54.00 per cent mortality. Badua,[5] in his experiment with mungo at levels of 10 and 20 per cent in chick rations supplemented with cow manure, obtained average mortality rates of 38.61 and 39.44 per cent, respectively. All these rates of mortality are markedly higher than those obtained in any of the lots in this study.

It can be concluded that the apparently low mortality in this study was due, to a large extent, to the APF supplement which is claimed to contain certain factors which inhibit the growth and multiplication of injurious microorganisms in the digestive tracts of birds.

LITERATURE CITED

Asmundson, V. S., and I. Michael Lerner. 1942. Breeding chickens for meat production. California Agric. Exper. Sta. Bull. 675: 1–39.

Bird, H. R., M. Rubin, D. Whitson, and S. K. Haynes. 1948. Effectiveness of dietary supplements in increasing hatchability of eggs and viability of progeny of hens fed a diet containing a high level of soybean oil meal. Poultry Sci. 27: 302.

Diñgayan, Alfonso B., and F. M. Fronda. 1950. A comparative study of the influence of the leaves and young shoots of centrosema, ipil-ipil, and sweet potato as green feed on the growth of chicks. Philippine Agriculturist 34: 110–115.

Johnson, E. L. 1949. APF for poultry. Iowa Farm Sci. 3: 3.

Ramos, Francisco T. 1950. A comparative study of two rations for growing chicks. Philippine Agriculturist 33: 257–262.

Wiese, A. C., C. F. Petersen, and C. E. Lampman. 1949. Activity of a microbial animal protein factor concentrate in a high energy broiler ration. Poultry Sci. 28: 752.

[5] Badua, Felipe C. The influence of rations with varying amounts of fish and mungo (*Phaseolus aureus* Linn.) meals supplemented with cow manure on the growth of chicks. (Thesis presented for graduation from the College of Agriculture. 1950. Unpublished.)

TABLE 1

Average initial and weekly weights of New Hampshire chicks

AGE (Weeks)	LOT 1				LOT 2				LOT 3			
	Trial			Average	Trial			Average	Trial			Average
	1	2	3		1	2	3		1	2	3	
	grams	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*
Initial	40.3	39.8	41.1	40.4	39.8	39.4	39.3	39.5	37.7	39.6	40.1	39.1
1	55.2	54.4	57.4	55.5	53.4	54.8	55.6	54.5	51.5	49.3	57.8	52.9
2	92.0	82.2	98.8	91.6	80.1	82.7	90.8	84.3	77.5	73.5	88.3	79.3
3	139.0	122.3	148.8	135.7	116.9	120.2	126.1	120.9	95.2	108.2	121.8	108.3
4	178.9	169.9	223.0	187.9	169.0	160.1	206.4	177.7	124.8	163.1	155.2	146.5
5	245.9	238.9	296.3	259.0	216.8	225.4	250.2	229.7	161.4	222.0	188.9	191.5
6	338.4	295.0	386.2	335.8	274.4	294.1	323.6	295.8	195.3	258.6	249.0	236.0
7	443.0	378.8	521.1	437.3	341.7	398.5	428.7	386.1	246.1	317.3	321.0	293.7
8	562.0	474.8	610.3	543.5	404.0	474.3	511.4	463.8	298.5	377.2	361.7	348.9
9	689.7	574.0	698.8	648.8	493.6	584.4	587.5	558.9	351.5	478.1	436.0	431.9
10	808.9	687.0	776.5	753.1	561.8	702.6	694.1	648.4	420.7	582.1	536.5	513.8
11	895.2	789.5	889.6	853.3	663.4	854.1	783.3	770.6	499.0	658.1	605.2	587.4
12	1,008.9	898.9	1,012.9	968.3	736.9	968.5	931.4	880.1	584.8	699.1	721.5	669.3

TABLE 2

Cost of feed consumed and returns above feed cost based on 100 twelve-week-old chicks

ITEMS	LOT 1				LOT 2				LOT 3			
	Trial			Av.	Trial			Av.	Trial			Av.
	1	2	3		1	2	3		1	2	3	
Total amount of feed consumed, kilograms	337.1	292.3	260.4	329.9	297.9	272.1	308.6	292.9	218.2	248.9	235.7	234.3
Total cost of mash feed, pesos [a]	107.55	93.25	114.97	105.25	95.95	87.63	99.38	94.32	69.83	79.68	75.42	74.97
Average gain in weight of each bird, kilograms	0.97	0.86	0.97	0.93	0.70	0.93	0.90	0.84	0.55	0.66	0.68	0.63
Average feed consumption of each bird, kilograms	3.37	2.92	3.60	3.30	2.98	2.72	3.09	2.93	2.18	2.49	2.36	2.34
Feed required for every kilogram gain in weight, kilograms	3.47	3.39	3.70	3.53	4.27	2.92	3.46	3.49	3.98	3.77	3.46	3.72
Cost of feed to produce a kilogram gain, pesos	1.11	1.08	1.18	1.12	1.37	0.94	1.11	1.12	1.27	1.20	1.10	1.19
Weanlings produced, kilograms	100.9	89.8	101.2	97.3	73.6	96.8	93.1	87.8	58.4	69.9	72.1	66.8
Returns from sale of weanlings, [b] pesos	252.22	224.72	253.22	243.40	182.22	242.12	232.85	219.72	146.20	174.77	180.37	167.10
Returns above feed cost, pesos	144.67	131.47	138.25	138.15	88.27	154.49	133.47	125.40	76.37	95.09	104.95	92.13

[a] Cost of a kilogram of mash feed: Lot 1—₱0.319; lot 2—₱0.322; lot 3—₱0.320.
[b] Based on ₱2.50 a kilogram.

TABLE 3

Percentages of mortality

	LOT 1				LOT 2				LOT 3			
	Trial			Av.	Trial			Av.	Trial			Av.
	1	2	3		1	2	3		1	2	3	
No. of chicks at start	26	30	25	27.00	26	30	25	27.00	26	30	25	27.00
No. of chicks after 12 weeks	25	30	24	26.33	23	27	24	24.66	25	29	24	26.00
No. of chicks that died	1	0	1	0.66	3	3	1	2.33	1	1	1	1.00
Percentage of mortality	3.84	0.00	4.00	2.61	11.53	10.00	4.00	8.51	3.84	3.33	4.00	3.72

CAULIFLOWER GROWING IN LOS BAÑOS [1]

P. S. FAJARDO

WITH TWO TEXT FIGURES

Cauliflower, hitherto grown only in a few places like Baguio and Trinidad Valley, was planted in horticultural projects of the U. P. Rural High School at Los Baños. The conditions and results of the two-year planting are described in this article.

Cauliflower, *Brassica oleracea* Linn. var. *botrytis* Linn., is an annual plant grown for its tender, succulent, thickened, profuse, undeveloped flowers and flower stalks instead of its leaves, although the young and tender leaves are as palatable as pechay and mustard. This excellent vegetable has been known for more than 2,000 years in Europe and perhaps for 200 years in America. It has been a popular market and home-garden crop in the United States since 1925.

The sensitivity, difficulty of culture, and relatively high price of the cauliflower have made it the aristocrat of the cabbage family. The culture of this plant in the Philippines is limited to only a few places, as Baguio, Trinidad Valley in the Mountain Province, and other regions where the climate is cool.

The importance of cauliflower in the diet deserves mention, for it contains fair amounts of vitamins A and C and is a good source of vitamin B. As a vegetable, it is an important source of the various minerals needed by the body. It also contains nearly ten times as much calcium as meat, fourteen times as much as rice, and twice as much as eggs. [2]

VARIETIES AND YIELD

In the horticultural projects of the U. P. Rural High School, two varieties of cauliflower obtained from the Department of Agriculture and Natural Resources were tried for planting for two consecutive years, from 1949 to 1951. These varieties were Early Market and Early Patna, which are reported by the Bureau of Plant Industry to be adapted to lowland culture. They yield from 3 to 5 tons to the hectare. In the Rural High School, out of the 7,142 seedlings planted in one season on a lot of 2,500 sq. m., 5,285 heads were harvested, the diameter of the heads ranging from 5 to 12 cm. (2 to 5 inches).

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[1] Central Experiment Station Contribution No. 1665.

[2] RIPPERTON, J. C., AND N. A. RUSSELL. 1926. Hawaiian vegetables and their functions in the diet. Hawaii Agric. Exper. Sta. Extension Bull. 9: 1-6.

SOIL AND CLIMATIC REQUIREMENTS

Cauliflower can be grown successfully on heavy to light soils that are of good fertility, rich in organic matter, and high in nitrogen content. For the production of high-quality curds, however, fairly heavy soil of high water-holding capacity is the best. Good crops are also produced from lighter soils, provided that they are fertile and the plants are well supplied with moisture. Good drainage is essential, but cauliflower must not be permitted to lack water. Unsatisfactory soil conditions may upset the development of the plant and cause the premature formation of small heads or "buttons."

The success of growing this crop is also dependent upon climate. Cauliflower must be grown in places where low temperature and a relatively high atmospheric humidity prevail during the growing season. Commercial production of cauliflower may be profitable in places where the atmosphere is cool and humid because of high altitude and nearness to large bodies of water.

GROWING OF THE SEEDLINGS

In the horticultural projects of the U. P. Rural High School, the cauliflower seeds were first sown in the seedbed. In locating the seedbed, the following points were considered: (1) nearness of the field, (2) availability of water supply, and (3) presence of well-drained, fertile soil that is rich in organic matter and open to sunshine.

Preparing the seedbed. A seedbed adjacent to the field and near a source of water was prepared during the latter part of September. It measured 1 meter by 10 meters for the lot of 2,500 sq. m., or five seedbeds, 1 meter by 10 meters each, to the hectare. The seedbed was deeply dug and the soil was thoroughly pulverized, leveled, smoothed, and sterilized. Sterilizing the soil was done by "firing," that is, combustible materials like dry cogon and rice straw were spread over the prepared plots and burned. This was repeated three times, and each time, the soil was turned under to heat the under surface. The object of sterilizing the soil in the seedbed was to prevent the occurrence of damping-off, a serious disease of seedlings, and also to check the germination of any weed seeds.

Sowing the seeds. The seeds were sown right after the seedbed had been prepared. The amount of seeds used was 75 grams, or 250 to 350 grams to a hectare. The seeds were sown thinly and evenly by the broadcast method. They were then covered just enough with broadcast soil that had been prepared and put aside previously. The bed was watered. To hasten the germination of the seeds, the bed was covered with clean, wet gunny sacks. The seeds germinated within three days after sowing.

Ants called "fire ants" affect the percentage of germination because they steal the seeds or bite them. These ants were prevented from harming the seeds by means of "rice shorts" scattered along the

sides of the bed. The amount of the bait was such that before it was consumed, the seeds had already germinated.

Caring for the seedlings. The seedbed was kept moist all the time by watering twice a day, in the morning and in the afternoon, especially when the weather was dry. Watering, however, was done in such a way that the water did not overflow the surface of the seedbed.

To forestall the adverse effect of strong sunshine, the seedlings were shaded with a portable shed made of cogon clipped with bamboo slats and supported by small posts as high as the waist.

To quicken growth and make the seedlings vigorous, they were watered once a week before transplanting with a solution of 50 grams ammonium sulfate to every five gallons of water. Since ammonium sulfate has a burning effect on the tender leaves, care was taken not to scorch the leaves by watering the seedlings all over again with plain water.

Pricking the seedlings. The cauliflower plants were pricked when they already had one to two pairs of true leaves or when they were two to three weeks old, or about 2.5 cm. to 5 cm. (an inch or two) in height. They were spaced in the pricking bed 5 cm. (two inches) each way. The care of the pricked seedlings consisted of watering, partial shading when necessary, and fertilizing.

Hardening the seedlings. The cauliflower seedlings were not subjected to sudden exposure in the field at transplanting. They were made more hardy by limiting the amount of water given them, by gradually exposing them to higher temperatures, and by withholding the fertilizer solution for a week before transplanting.

PREPARATION OF THE FIELD

The field for planting cauliflower was prepared as soon as the seeds had been sown in the seedbed, that is, during the latter part of September. The soil was considered in favorable condition for working when it was moist or when it crumbled easily when tilled. The field was plowed two or three times and harrowed as many times. The next step was "bedding" or ridging the land. The beds were spaced 30 cm.; the width of each bed was 40 cm.

TRANSPLANTING OF THE SEEDLINGS

Planting should be done during a cloudy day when possible. The cauliflower seedlings were transplanted four to five weeks after sowing, or when they were approximately 7 to 10 cm. in height (fig. 1, left).

Before the seedlings were taken out of the seedbed, they were watered to loosen the soil and to minimize the destruction of roots. With the help of a hand trowel, the seedlings were lifted and placed in a shallow basket for transporting to the field (fig. 1, center). A hole was dug in the center of the bed and the seedling with a ball of

soil was set in (fig. 1, right) slightly deeper than the original level of the plant in the seedbed. Then the soil was returned into the hole,

Fig. 1.—Left, cauliflower seedlings in the pricking bed ready for transplanting; center, lifting a seedling from the pricking bed; right, setting a seedling in the permanent bed. (*Courtesy of the Photographic Division, College of Agriculture*)

and the soil around the plant was slightly firmed. The plants were watered after transplanting to prevent wilting. In hot weather, the transplants were shaded with banana leaf sheaths.

CULTIVATION, WEEDING, AND FERTILIZATION

To prevent weed growth and surface crusting, cultivation was started soon after the plants had fully recovered from the effects of transplanting and was done as frequently as the weeds appeared. Deep cultivation was avoided, especially during the later stages of growth, as the roots would be injured. A trowel or a light garden hoe was used for this purpose.

Partially decomposed horse manure was applied at the rate of 300 grams to a plant or 10 tons to the hectare. This fertilizer was mixed thoroughly with the soil in each hole before the plants were transplanted. Ammonium sulfate was also applied in two installments at the rate of 10 grams to a plant, or 250 kilograms a hectare, by "ringing" the soil around the base of each plant and covering the fertilizer slightly. The first application was made a week after transplanting or when the plants had fully recovered from the effects of transplanting; the second application, two weeks after the first application.

PESTS AND DISEASES

Three kinds of worms were observed attacking the cauliflower plants. They were the common pyralid caterpillar (*Crocidolomia binotalis* Zeller), the common cutworm (*Prodenia litura* Fabricius), and the diamond-backmoth (*Plutella maculipennis* Curtiss).[3] The

[3] These three worms were identified by Dr. Silverio M. Cendaña of the Department of Entomology.

damage caused by them was not alarming enough to warrant any intensive control measure. Control was done by practicing clean culture and by applying a dose of calcium arsenate spray at the rate of 10 grams, with an equal amount of hydrated lime, to every 5 liters of water when the plants had not yet flowered.

No serious disease was observed in the field.

Fig. 2.—Upper panel, blanching cauliflower plants; lower panel, a cauliflower plant with an average-sized curd ready for harvesting; lower right-hand corner inset, curds of different sizes and of proper condition for the market. (*Courtesy of the Photographic Division, College of Agriculture*)

HARVESTING

Cauliflower heads or curds must be cotton white when properly grown; a marketable product is one that has this appearance. The curds that are of prime condition for harvesting must be fully developed, compact, clear white, and free from any discoloration or "riciness." When exposed too much to sunlight, the heads do not only become unattractive but also acquire an undesirable flavor. It

is essential, therefore, that they be protected from strong sunlight to obtain the quality demanded. In the U. P. Rural High School, this was done by gathering the longest leaves together over each head and tying them with a strip of banana leaf sheath. This practice is known as blanching (fig. 2). Blanching was employed when the buttons or small heads were as big as fifty-centavo pieces. In four to five days, the blanched curds were ready for harvesting.

The cauliflower plants do not all develop heads at the same time. It is necessary, therefore, to go over the entire field and blanch those that are ready. Blanching, however, can be dispensed with if the buttons are protected by the small incurved leaves surrounding the head or by the leaves that are long and upright.

The curds must be harvested promptly. Overdeveloped curds become "ricy" and "feathery." In this condition, they are unsavory and have little or no market value. The size or the heavy weight of the heads is not a proper criterion for harvesting. In fact, it is better to harvest the heads a little early than late. The average diameter of curds ready for harvest (fig. 2) is about 10 or 12 cm. (four inches). Cauliflower matures within three to four months after sowing.

The cauliflower heads were cut with a sharp bolo or a big knife, leaving one or more whorls of leaves intact for protection of the curds. They were then graded, trimmed, and prepared for the market.

Cauliflower curds are greatly in demand although they are more expensive than cabbage. In fact, cauliflower has been called the "rich man's cabbage." A kilo of high-quality curds sells as high as ₱1.20 to ₱1.50 and as low as fifty centavos.

A COMPARISON OF TWO RATIONS FOR GROWING CHICKS [1]

FRANCISCO C. BANDONG

The College all-mash chick ration was more efficient and economical in effecting growth than Vitamelk. At twelve weeks of age, the chicks fed with the College all-mash chick ration (lot 1) were heavier than the Vitamelk-fed chicks (lot 2). Mortality, however, was higher in lot 1 than in lot 2. On the average, the birds in lot 1 consumed less feed to gain a kilogram gain in weight than those in lot 2. Lot 1 gave higher returns above the cost of feed than lot 2.

The growing interest of the Filipinos in the poultry industry has directed considerable attention to the improvement of poultry rations, especially for growing chicks. One of the popular brands of poultry feed is Vitamelk.[2] It contains an imported base concentrate with high-quality protein supplements and a good amount of vitamin and mineral reinforcements, which are expected to accelerate the growth of chicks.

This study was conducted in the Department of Animal Husbandry from October, 1950, to January, 1952, to ascertain the cost and influence on growing chicks of Vitamelk, as compared to the College all-mash ration.

MATERIALS AND METHODS

A total of 340 day-old New Hampshire chicks were leg-banded and divided equally into two lots which were used in four trials of twelve weeks each. The chicks were confined in adjoining concrete compartments with rice hulls as litter. They were kept at night in artificially heated brooders.

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[1] Central Experiment Station Contribution No. 1666. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture, April, 1952. Prepared in the Department of Animal Husbandry under the direction of Professor F. M. Fronda and Instructor A. C. Campos.

[2] According to the manufacturer, Vitamelk is composed of rice bran, ground corn, copra meal, soybean-oil meal, fish meal, meat meal, ground oats, alfalfa meal, salt, shell powder, and Vitamelk Base containing dried grain fermentation solubles, soybean-oil meal, wheat-germ meal, animal-liver meal, fish meal, fish liver and glandular meal, dried whey, dried buttermilk, dried milk albumin, dried yeast, riboflavin supplement, vitamins A and D feeding oil, wheat-germ oil, vitamin A feeding oil, D-activated animal sterol (source of vitamin D-3), D-activated plant sterol (source of vitamin D-2), carotene, calcium pantothenate, animal protein factors supplement, choline chloride, niacin, manganese sulfate, potassium iodide, iron sulfate, and cobalt sulfate.

The chemical analysis of the chick starter and the growing mash is guaranteed to be as follows:

	%
Protein, minimum	18.0
Fat, minimum	4.0
Fiber, maximum	8.0
Ash, maximum	10.0

The control lot (lot 1) received the College all-mash chick ration, which consists of the following ingredients, all parts by weight:

Rice bran	55
Corn, ground	20
Fish meal	20
Copra meal	5

Lot 2 received the Vitamelk 18 per cent chick starter during the first six weeks and the Vitamelk 18 per cent growing ration during the last six weeks.

The chicks had access at all hours to the feeds, which were given dry. Chopped green feed, either *Centrosema pubescens* Benth. or *Leucaena glauca* (Linn.) Benth., was given three times a week to lot 1. Grit and ground shells were also made available to lot 1. The birds in lot 2 did not receive any green feed, but they had free access to grit. Except for the difference in ration, the chicks in each trial were given practically the same management and care.

The initial and weekly weights of the chicks, the amount and cost of feed consumed, and the rate of mortality were recorded.

DISCUSSION OF RESULTS

Rate of growth. The average weight of the chicks at different ages indicated the influence of the feed on their rate of growth.

The initial weights of the chicks in both lots were practically the same. Throughout the experiment, the chicks fed with the College all-mash chick ration were consistently heavier than the Vitamelk-fed chicks. On the twelfth week, the average weight of the birds in lot 1 was 947.4 grams, and that of lot 2 was 722.7. Judging by the weight of the chicks at the end of the observation and considering the lot with heavier chicks as 100 per cent efficient, the rate of growth of lot 2 was only 76.28 per cent.

In all trials except the first, the chicks in the control lot showed heavier weights than the experimental chicks from the fourth week to the end of the study. The difference between the two lots was 252.6 grams in trial II, 85.3 grams in trial III, and 373.8 grams in trial IV. In trial I, on the other hand, lot I gained heavier weight than lot 2 starting on the sixth week. As in the other trials, however, the weight advantage of the control lot was maintained up to the twelfth week.

Mortality. The mortality was 32.4 per cent in lot 1 and 11.8 per cent in lot 2, the toll being consistently higher in the control lot than in the experimental lot (table 2). The unusually high mortality in both lots in trial IV was due to coccidiosis which broke out because of the changing weather during the period.

The apparently lower death rate in lot 2 may be attributed partly to the presence in the ration of animal protein factor, which is claimed to contain antibiotics that combat injurious microorgan-

isms in the digestive tracts of poultry, and partly to the presence of milk products, which create an acid condition in the ceca to which protozoans react unfavorably (Brister and Devries).[3]

Feed consumption and feed cost. On the average, slightly more feed was consumed by each bird in lot 1 than in lot 2. The feed intake of the chicks fed with the College ration was 80 grams more than that of the Vitamelk-fed birds. However, with the amount of feed required to produce a kilogram gain in weight as the measure of the feeding value of the rations, lot 1 chicks required markedly less than lot 2 chicks to produce the same gain in weight. Lot 1 required 3.52 kilograms; lot 2 required 4.39 kilograms of feed to produce a kilogram gain in weight. Furthermore, the College chick ration proved to be more economical than Vitamelk. Since the College chick ration cost only ₱0.26 a kilogram as against ₱0.37 of Vitamelk, each bird in lot 1 consumed approximately ₱0.91 of feed to put on a kilogram gain in weight, as compared to ₱1.62 consumed by each bird in lot 2.

The returns above cost of feed becomes the yardstick to determine the better ration. As shown in table 3, lot 1 had greater returns above the cost of feed. Based on 100 weanlings raised to twelve weeks of age and on the current selling price of fowls of ₱2.50 a kilogram live weight, the returns above cost of feed for all birds in lot 1 amounted to ₱156.34, and that of lot 2 to ₱73.17.

The results obtained clearly show that poultry diets, in order to be efficient, need not be expensive. Although variety in the ingredients used is often desirable, it is not enough to make a poultry ration complete; other factors, like proper nutritive balance, should be considered.

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[3] Brister, H. E., and Louis Devries. 1945. Diseases of poultry. xiii + 1005 p., 324 fig. Ames, Iowa: The College Press, Inc.

TABLE 1

Average initial and weekly weights of the chicks

WEEKS	TRIAL I		TRIAL II		TRIAL III		TRIAL IV		AVERAGE WITH STANDARD ERROR	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
	grams	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*	*grams*
1 day	38.3	38.2	41.6	39.7	38.2	38.5	40.9	41.3	39.9 ∓ 0.46	39.7 ∓ 0.42
1	59.5	63.3	56.9	49.2	55.0	52.9	62.8	54.2	61.4 ∓ 1.19	54.0 ∓ 0.82
2	93.4	94.9	84.8	69.2	90.4	72.7	97.1	74.9	92.5 ∓ 2.61	76.0 ∓ 1.88
3	140.3	131.0	130.8	145.0	145.0	104.9	119.6	96.2	133.0 ∓ 4.40	105.4 ∓ 3.04
4	210.0	188.2	179.6	151.2	181.1	135.2	157.6	118.5	180.9 ∓ 6.50	141.9 ∓ 4.05
5	291.0	234.2	255.5	210.9	218.8	145.6	200.8	159.2	235.1 ∓ 8.11	180.0 ∓ 6.55
6	367.8	298.6	366.7	280.8	255.6	184.4	290.8	211.6	313.6 ∓ 12.83	23.5.6 ∓ 7.64
7	445.7	329.0	476.5	334.2	315.9	233.3	369.7	256.4	397.5 ∓ 16.15	281.2 ∓ 10.53
8	498.2	421.5	606.9	418.6	394.3	312.2	480.5	306.5	495.4 ∓ 19.68	354.9 ∓ 12.20
9	602.6	549.9	733.5	531.0	483.4	384.3	611.7	389.9	609.5 ∓ 21.69	449.8 ∓ 15.03
10	764.5	690.7	879.9	632.4	386.6	464.4	749.7	477.8	744.3 ∓ 24.04	548.3 ∓ 16.87
11	914.1	821.2	969.8	729.2	654.2	554.9	802.6	528.6	827.5 ∓ 25.77	634.2 ∓ 20.80
12	1,049.8	943.3	1,080.2	827.6	740.7	655.4	953.8	579.9	947.4 ∓ 29.32	722.7 ∓ 23.99
Percentage of relative efficiency[a]	100.0	89.85	100.0	76.66	100.0	88.47	100.0	60.79	100.0	76.28

[a] Based on the 100 per cent efficiency of the control lot (lot 1).

TABLE 2

Percentages of mortality

ITEM	TRIAL I		TRIAL II		TRIAL III		TRIAL IV		TOTAL	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
No. of chicks at start	25	25	40	40	45	45	60	60	170	170
No. of weanlings after 12 weeks	19	25	32	37	31	42	33	46	115	150
No. of chicks that died	6	0	8	3	14	3	27	14	55	20
Percentage of mortality	24.0	0	20.0	7.5	31.1	6.6	45.0	23.3	32.4	11.8

TABLE 3

Amount of feed consumed and returns above feed cost

ITEMS	TRIAL I		TRIAL II		TRIAL III		TRIAL IV		AVERAGE	
	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2	Lot 1	Lot 2
Amount of feed consumed, kg..	72.60	90.50	116.70	133.70	115.00	124.90	119.50	122.60	105.90	117.90
Total cost of feed, pesos [a]	18.87	33.48	30.34	49.46	29.90	46.21	31.07	45.36	27.53	43.62
Average feed consumed by each bird, kg.	3.36	3.62	3.45	3.53	3.02	2.87	2.89	2.35	3.18	3.10
Weanling produced, kg.	19.95	23.58	34.57	30.62	22.96	27.53	31.48	26.68	27.24	27.10
Average gain in wt. of each bird, kg.	1.01	0.91	1.04	0.76	0.70	0.62	0.91	0.54	0.92	0.71
Feed required for every kg. gain, kg.	3.32	3.97	3.31	4.64	4.31	4.62	3.17	4.35	3.52	4.39
Cost of feed to produce a kg. gain, pesos	0.86	1.46	0.86	1.46	1.12	1.70	0.82	1.60	0.91	1.62
Returns from sales of weanlings, pesos [b]	49.87	58.95	86.42	76.55	57.40	68.82	78.70	66.70	68.10	67.75
Returns above cost of feed, pesos	31.00	25.47	56.08	27.09	27.50	22.61	47.63	21.34	40.57	23.13
Returns above feed cost for 100 weanlings, pesos	175.09	101.88	180.35	76.29	106.63	57.66	163.31	58.02	156.34	73.17

[a] The control ration (lot 1) cost ₱0.26 a kilogram and the experimental (lot 2) cost ₱0.37.
[b] Weanlings were priced at ₱2.50 a kilogram live weight.

COLLEGE AND ALUMNI NOTES

Mr. and Mrs. Burton Oñate returned from the United States on May 22, 1952. Mr. Oñate, '47, a U. P. fellow, obtained the degree of Master of Science, major in statistics, from the Iowa State College of Agriculture and Mechanic Arts. Mrs. Oñate (nee Luz Uichanco, '48), took postgraduate courses in chemistry and nutrition. She also returned with a master's degree. Mr. Oñate is a member of the staff of the Department of Agricultural Engineering.

Another new arrival is Miss Filomena Mercado, a librarian of the College who recently returned from Australia where she attended a seminar course in library science. Miss Mercado was the recipient of a fellowship from the Australian government. During her three months' stay in Australia, she visited several university libraries and observed various trends in library work.

A scholarship for the U. P. College of Agriculture at Los Baños has been granted to Gabino Custodio of Cavite City by a Trust Estate through C. M. Hoskins. The scholarship covers allowance for board and lodging and semestral fees exclusive of laboratory fees. Continuance of the scholarship will depend on the affirmative recommendation of the Dean, based on the student's character, work, and progress in his studies.

Twenty-one students qualified for the honor roll at the close of the second semester of the academic year 1951-52; nine of them are graduates of the U. P. Rural High School. The honor students, arranged according to their average ratings, are Ibarra S. Santos, Orlando J. Sacay, Concepcion L. Valera, Rodolfo M. Ela, Elvira B. Manzanilla, Romeo A. Obordo, Santiago N. Tilo, Lito L. Calo, Alfredo L. Eloja, Ricardo M. Lantican, Marcos R. Vega, Jr., Romualdo V. Eusebio, Faustino G. Dictado, Jr., Delfina M. Torreta, Marciano B. Lopez, Basilio N. de los Reyes, Edilberto A. Uichanco, Amador D. Yñiguez, Francisco A. Bernardo, Angelito R. Sandoval, and Igmidio T. Corpuz.

Mr. Eligio Tavanlar, '26, was recently inducted as president of the Manila Lions Club.

Mr. Quintin Eala, '27, at present chief of the library division of the Institute of Science and Technology, has just returned from a three-month seminar course in librarianship in Australia. Mr. Eala was granted a fellowship by the Australian government.

Capt. Octavio Alzona, '33, visited the College on May 16, 1952. Capt. Alzona is the chief of the Planning Office of the EDCOR, Camp Murphy. Other alumni connected with the EDCOR are Capt. Nicanor Bartolome, '33, and Lt. Marcos J. Aldama, '35.

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